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(54) **Nesting cups**

(57) A cup capable of nesting with identical cups to form a stack, each cup comprising a bottom wall 2 and a sidewall 4 extending generally upwards and outwards from the bottom wall, the cup including lower, external and upper, internal locking means c, d, which, when an upper and a lower cup, in upright attitude, are in nesting engagement, cooperate to resist separation of the cups, but nevertheless permit the cups to be separated by external forces and a lower, external and upper, internal sealing surface 10, 12 which, when an upper cup and a lower cup are in the said nesting engagement, cooperate to isolate from the atmosphere a space between the bottom walls of the two cups.

Fig.5.

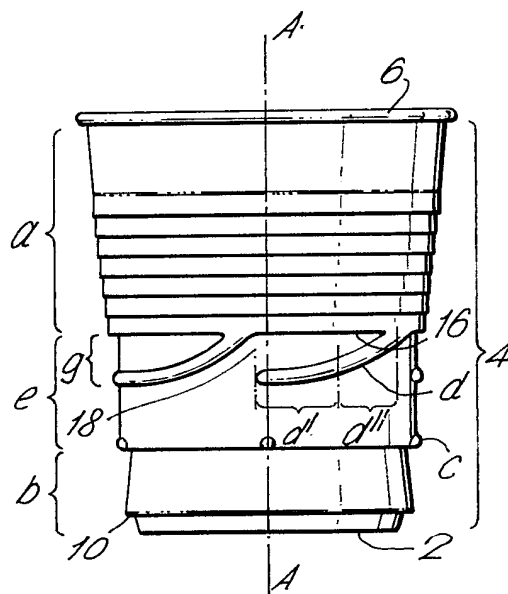


Fig.1.

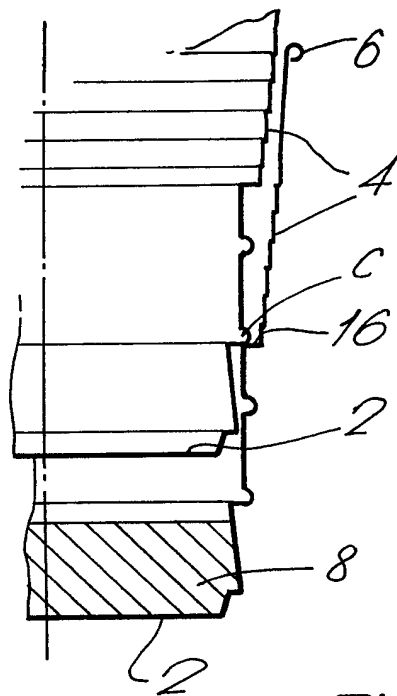


Fig.2.

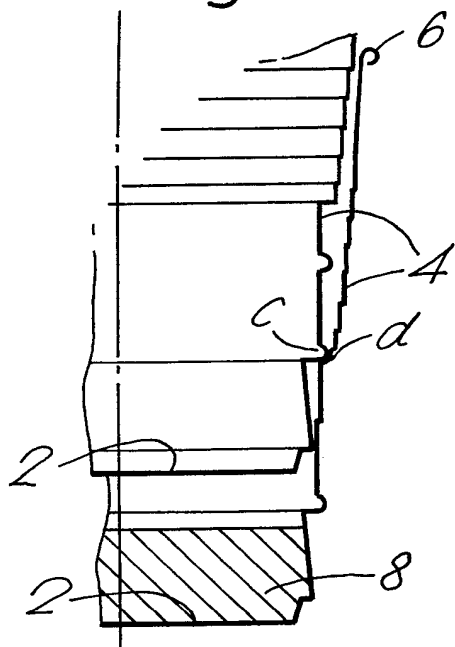
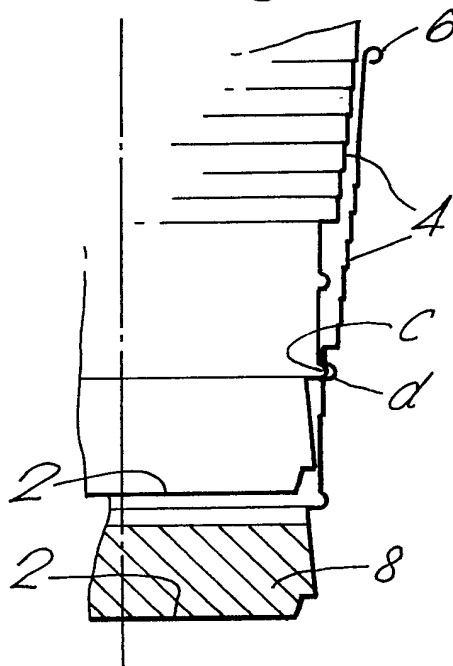
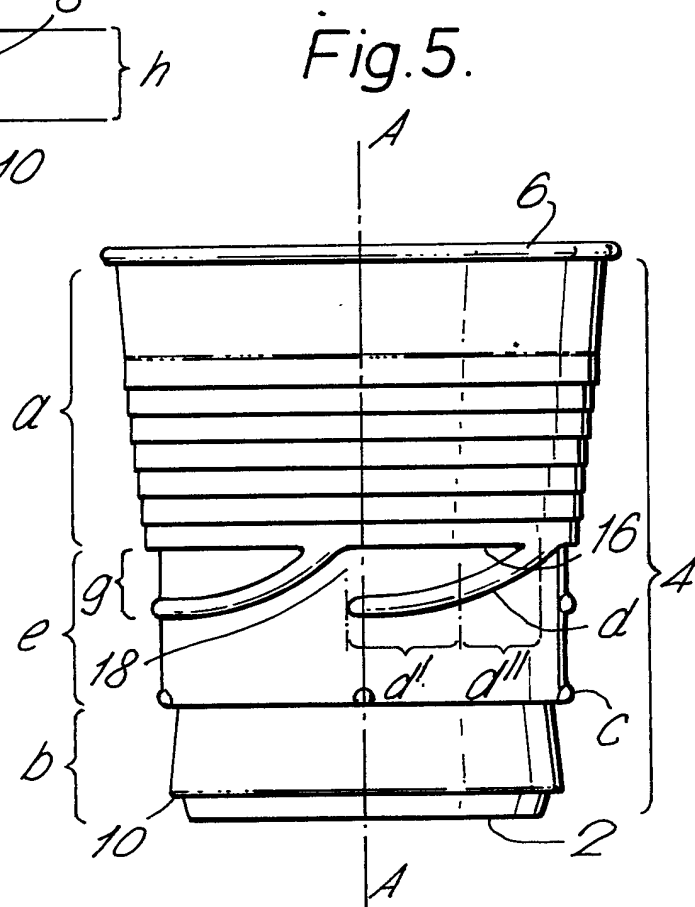
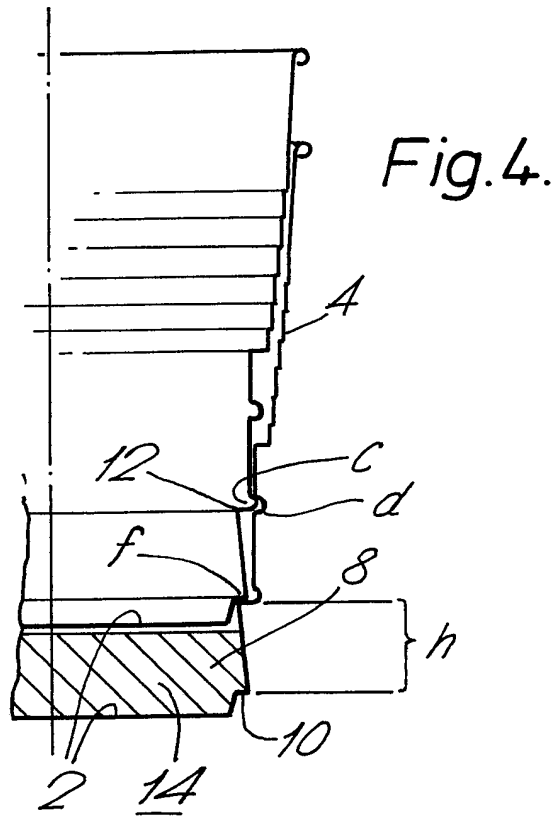


Fig.3.





SPECIFICATION

Nesting cups

5 This invention relates to cups capable of nesting with identical cups to form a stack, each cup comprising a bottom wall and a sidewall extending generally upwards and outwards from the bottom wall, the cup including lower, external and upper, internal locking means which, when an upper and a lower cup, in upright attitude, are in nesting engagement, cooperate to resist separation of the cups, but nevertheless to permit the cups to be separated by external forces.

15 One use of such cups is as so-called "ingredient cups". Such cups are assembled together in a stack, with a measured quantity of powdered ingredient in each of the spaces defined between the bottom walls of adjacent cups. Typically such an ingredient serves to provide a beverage when a single cup is separated from the stack and is filled with hot water.

20 It is desirable to provide a seal between adjacent cups, thus isolating the space between the bottom walls, in order to prevent escape of the powder during transport and handling of the stack, and also to prevent access of the atmosphere to the powder.

25 Cups according to the present invention are of the kind including a lower, external and upper, internal sealing surface which, when an upper cup and a lower cup are in the said nesting engagement, cooperate to isolate from the atmosphere a space between the bottom walls of the two cups.

Furthermore, in a cup according to the present invention the lower and upper locking means are shaped, and interengage, in such a manner that separation of the two cups from the nesting engagement must start with a first relative movement of the cup sidewalls having a circumferential component accompanied by little or no axial component, followed by a second relative movement having an axial component greater than the axial component of the first relative movement, and a circumferential component which is less than the circumferential component of the first relative movement, or is zero.

45 The accompanying drawings show one example of cups embodying the present invention. In these drawings:-

Figures 1 to 4 are diagrammatic vertical sections through two cooperating cups in a sequence of relative positions, as they are assembled into nesting engagement; and

Figure 5 is a side elevation of one of the cups.

The cup shown in Figure 5 is made by thermoforming from sheet plastics material. It consists of a bottom wall 2, and a sidewall 4 extending upwards and outwards from the bottom wall, and terminating in a curled rim 6. The cup is intended to be nested with other identical cups, into a stack in which each space between the bottom walls 2 of two adjacent cups contains an ingredient 8, which can later be used to make a drink with water when a single cup is removed from the stack.

As shown in Figure 5, the sidewall 4 includes a portion *b* concerned with sealing, a portion *e* concerned with locking, and a portion *a* providing a hand grip.

65 The operation of sealing is illustrated in Figure 4. Each cup has a lower, external sealing step 10 and an upper, internal sealing step 12. When two cups are in nesting engagement, the step 10 of the upper cup engages the step 12 of the lower cup as indicated at *f*, so as to form a seal which isolates from the atmosphere the space 14 between the bottom walls 2, 2 of the two cups, containing the ingredient 8.

70 The locking portion *e* includes external pips *c*, and internal grooves *d*. In the example, there are four pips *c* and four grooves *d*, each equally spaced around the circumference.

The process of assembly of two cups into nesting engagement is illustrated by Figures 1 to 4. In Figure 1, a pip *c* on the upper cup is not in register with the upper end of a groove *d*, but is resting on a step 16.

In Figure 2 the pip *c* has begun to enter a groove *d*, and all the other pips *c* will have begun to enter respective grooves *d*.

85 In Figure 3, the pip *c* has travelled about half way along the length of the groove *d*.

In Figure 4 the pip *c* has reached the closed lower end of the groove *d*, and the cups are locked together. By "locked" is meant that reasonable axial force exerted on the two cups will not separate them.

It will be seen from Figure 5 that each groove *d* has somewhat the nature of an interrupted thread, but also somewhat the nature of the slot of a bayonet-type connection. That is to say the groove portion *d'* nearest the closed lower end has a circumferential component accompanied by a small axial component, while the groove portion *d''* has an axial component which is greater than the axial component of the portion *d'*, and a circumferential component which is less than the circumferential component of the portion *d'*.

100 In fact, the groove *d* is continuously curved, concave upwards, so that the fraction of the groove immediately adjacent to the lower closed end is substantially horizontal, i.e. in a plane perpendicular to the vertical axis A-A of the cup.

Thus in order to bring one cup into nesting engagement with another, it is necessary to impart both an axial and a rotary relative movement, and in separating one cup from another it is necessary to impart a rotary and an axial movement. Some existing machines for filling cups with ingredients do include scrolls which turn the cups, and some existing vending machines do include scrolls for turning the cups. Adaptation of such machines to handle cups according to the present invention is therefore possible.

A number of variations are possible from the construction shown in the drawings:-

120 The grooves could be external, and the pips internal, so that the grooves on an upper cup cooperate with the pips on a lower cup, the pips being then at a higher level on the cup than the grooves.

Instead of being continuously curved, the grooves might have two or more straight portions linked together, and the portion nearest the mouth of the groove might extend vertically, i.e. parallel to the cup axis A-A.

The cup wall at 18 between the grooves *d* could have any ornamental pattern.

The axial extent *g* of the grooves is not related to the stacking height *h* (see figure 4), but is chosen simply to ensure adequate cooperation between the grooves and the pips.

The finger-grip rings in the side wall portion *a* are not essential. Furthermore, the locking portion *e* could be placed at a higher level in the cup, even immediately adjacent to the rim 6.

The steps 10 and 12 are shown flat, but could be portions of cones. These steps can be made sufficiently robust so that they not only form a seal, but also act to resist telescoping of the cups together beyond their intended position of nesting engagement.

The positions of the steps 10 and 12, and of the pips *c* and the closed lower ends of the grooves *d* should be so designed dimensionally as to ensure that, when the pips are at the closed lower ends of the grooves *d*, then the steps 10 and 12 are certainly touching, and preferably are positively held together, with adjacent side wall portions in a somewhat stressed condition.

The cups shown in the drawings have a single thin wall. The invention is also applicable to double-walled cups; and to cups having a thicker wall, for example of a foam between two surface skins. The materials used are preferably plastics, but other materials, for example waxed paper, may be used.

CLAIMS

1. A cup capable of nesting with identical cups to form a stack, each cup comprising a bottom wall and a sidewall extending generally upwards and outwards from the bottom wall, the cup including lower, external and upper, internal locking means, which, when an upper and a lower cup, in upright attitude, are in nesting engagement, cooperate to resist separation of the cups, but nevertheless to permit the cups to be separated by external forces and a lower, external and upper, internal sealing surface which, when an upper cup and a lower cup are in the said nesting engagement, cooperate to isolate from the atmosphere a space between the bottom walls of the two cups; the lower and upper locking means being shaped so that in use they interengage in such a manner that separation of the two cups from the nesting engagement must start with a first relative movement of the cup sidewalls having a circumferential component accompanied by little or no axial component, followed by a second relative movement having an axial component greater than the axial component of the first relative movement, and a circumferential component which is less than the circumferential component of the first relative movement, or is zero.

2. A cup according to claim 1, in which the lower and upper locking means are respectively external pips and internal grooves, and each groove is continuously curved, concave upwards, so that the frac-

tion of the groove immediately adjacent to the lower closed end is substantially horizontal.

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